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ABSTRACT

The validity and reliability of the Yugoslavian (Beograd) version of the Hungarian adaptation of the Torrance Divergent Capacities Test (HAT-DAT) were tested, with a view toward improving the methodology of scoring the creative abilities test and determining standards for Yugoslavia. The test, based on the work of J. P. Guilford (1977), examines the basic divergent problems of fluency, flexibility, and originality. It contains four subtests--circles, kidney (picture construction), tin can (unusual multiple utility), and monkey (object improvement)--out of the nine in the original Torrance version. The reliability of independent expert assessment of children's paintings and stories was also assessed. Research began in 1978-79 with 104 children; they were studied for the 4 years following enrollment in grade 1. Children were tested with the HAT-DAT in grades 1 and 3. The creative value of artwork and writings from grade 3 was independently assessed by experts from representative fields. The HAT-DAT was not reliable when item analysis, factor analysis, and retesting were used. Correlating test results with results from artwork and stories produced by the children showed that the test was neither valid nor predictive. Independent assessments of children's creative products were not congruent and were no better indicators of divergent abilities than was the test. While the testing method can be improved, results will still not be useful. Study results call the Guilford theoretical approach into question and make the theoretical status of fluency, flexibility, and originality problematic. (SLD)

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MEASURING DIVERGENT ABILITIES

This paper represents part of a graduate MA thesis titled "Creativity in Young School Children - Their Divergent Thinking Abilities and Personality Traits as Evaluated by Tests and Other Methods". The Thesis was successfully defended in 1987., at the University of Beograd Humanities School, before a committee composed of the following members: professor Ivan Ivić, Phd. - mentor, professor Vera Smiljanić, Phd, and assistant professor Panta Kovačević, Phd.

The objectives of the research project were: a) an evaluation of the methods of assessment of creative (divergent) abilities, including divergent capacities tests and the evaluation of children's creative products; or rather, the standards of divergent thinking achievement for the given age level, and c) determining an outline of the personality of creative children. The subject of this investigation are divergent abilities in young school children, viewed through their various manifestations.

Research began in 1978/79, with the enrollment of children into first grade elementary school (Josip Broz Tito, New Beograd), on a sample of 104 subjects of both sexes, and lasted over a period of four years, as a longitudinal study. The children were individually tested with the NBS Scale upon enrollment, when biographical data were gathered from the parents about their childrens' pre-school development. In first and third

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grade, the children were tested individually with the HAT-DAT (Beograd version of the Hungarian adaptation of the Torrence Divergent Capacities Test) test. In third grade, the children were tested in groups with the junior version of the modified (adapted) EPQ Personality Test, and in fourth grade, they were given the CPQ Test. In third grade we collected children's various works, (free compositions, paintings, and free construction work), upon which the creative value was independently assessed by a number of experts of respective branches of work. We also collected data on general school achievement of each individual pupil, as well as achievement in relevant school subjects (Serbo-Croatian, art, technical education, and mathematics (as a control variable), during the period between first and fifth grade.

The data analysis comprised four stages: elaboration of the scoring criteria on the HAT-DAT Test and testing the psychometric characteristics, a selection of the best indicators of divergent abilities, and correlating them with the evaluation of the childrens' work products, inteligence, personality traits, school achievement and biographical data.

A presentation of the study will be given in several parts, in which the first part given here, deals with problems of scoring and psychometric characteristics of the HAT-DAT Test.

THEORETICAL APPROACH

Creativity in general, and even more so, children's creativity, is very difficult to define precisely, and the definition really always depends on the author's point of view. The definition usually relates to some of the manifestations of the phenomenon, such as the creative product, creative process, personality traits of the creative individual, or the external conditions favorable for the development of creativity.

There are great dilemmas in establishing the criteria in attributing the quality of creativness on the level of each of the above mentioned manifestations of the phenomenon. This problem is especially pronounced in the analyses of the creative individual's personality and the creative process, at a time when the work has not as yet been socially nor historically recognized. When this is the case however, the research is usually retrograde and therefore not reliable enough.

Synthesizing the various definitions, we may conclude that "creativity results from cummulated permeating and concurrence of various favorable factors or rather, the individual personality structure and environmental circumstances, which always, as its utmost effect (objective) has a product which the social environment acknowledges as a new and significant one", (modified definition - Milan Milinković, Psihološka istraživanja, 1980, page 143).

The situation is even more complex with children's creativity inasmuch the child is not mature and does not make a decision to be followed by a creative product, but rather creates spontaneously, most often through play, which makes it difficult to discern the unintentional achievements from those which occur as a result of actual creative dispositions of certain children. Besides, the developmental changes which a child's personality undergoes, and which do not occur as linear, abate the success of prediction concerning future creative production on the basis of products created during childhood and youth. Modifying the previous definition of creativity, we may conclude that "children's creativity results from specific abilities and preferences, actualized in a favorable atmosphere of the immediate environment through play-like activities, and may, (not necessarilly) have as a consequence an interesting and unusual product".

The subject of this study will conceptually be limited to only one prerequisite of creative production, to the cognitive component of the personality in the creative process (this classification is strictly conditional), in other words, the so called creative thinking of the divergent type, since many psychological studies show a specific and significant contribution of divergent thinking to the creative production. Since we were interested in stimulating creative behavior in school children, we analized divergent abilities in young school children.

Divergent thinking, for educational reasons, is often contrasted to convergent thinking in literature. Divergent thinking surpasses the limits of the assigned problem, the familiar frame of reference, it takes faraway and unvisited paths in a relaxed but curious fashion, resulting in multiple versions of answers or solutions. It engages to a greater extent, (especially in the incubation and illumination stage) the prelogical processes, typical for their associativity, imaginativeness and intuitiveness. It may wander far off and thus reach an inadequate, bizarre answer, but the convergent logical processes, (especially those engaged in the preparation, elaboration, evaluation and verification phases), decrease the possibility for the appearance of the negative effect.

It seems that the concept of "divergent thinking" describes well certain features of creative thinking and this is the reason why we chose to use it in defining the processes of creative production. The use of divergent processes in describing creative production is especially justified with children because they are oriented toward play as a divergent activity, and primarily as a process, not so much as outcomes which are vital to adaptive activities of convergent intelectual development.

In his theoretical model of human abilities, Guilford gives a detailed analysis of the disposition and function of divergent thinking and psychometrically tests their empirical existence, examining them through a number of psychometrically constructed instruments (tests). Numerous investigations within the Guilford psychological tradition as well as to a great extent, the application of these experiences in studying creativity, determined our theoretical approach.

Guilford makes a distinction between adaptive and spontaneous expression of divergent abilities, the first being closer to convergent processes and activated usually in the task of problem solving. The second are more separated from convergent processes and are usually activated in solving associative assignments. In any case, the basic divergent problems, according to Guilford, are: fluency, flexibility and originality, especially of ideas. Complexity, or rather, elaboration, is to a greater extent composed of convergent processes, eventhough it appears as a variable of divergent thinking. The objective of this study is to analize the manifestations of those divergent abilities which best describe divergent processes, or rather those, which least include interferences of convergent processes. This is why we chose to work with perspicuous variables of divergent abilities, like spontaneous fluency, flexibility and originality of ideas on the level of simple transformations of the initial stimulus on the semi-structured associative test problems within the figured and semantic (verbal) contents.

The following presentation pertains to the qualification of the test method of the assessment of divergent abilities, taking into consideration the results on the HAT-DAT Test in first and third grade (test-retest) and the information on the creative quality of children's works in third grade as a function of external criteria in the evaluation of child creativity (test-retest variable).

THE HAT-DAT DIVERGENT CAPACITIES TEST

HYPOTHESES CONCERNING THE TEST

In order to apply the HAT-DAT Test successfully in practice, primarily in identifying the divergent capacities in children, the test must meet all the psychometrical requirements concerning objectivity, discrimination, reliability and validity. Basing the quality asessment of a test on classical psychometric characteristics is justified because the test grew out of Guilford's theory, which in itself is based upon a psychometrical approach to the concept of abilities.

We assume that the HAT-DAT Test is objective, discriminative, reliable and valid.

If this assumption proves to be true, then it is sensible to use it in everyday practice, if not, we must define the reasons which give rise to faults in its functioning. The defects of the test must be analized from the practical, methodological and theoretical aspect, to be followed by suggestions for new solutions of the problem.

DESCRIPTION OF THE TEST

The associative divergent capacities test for children, named HAT-DAT is a modification of the Torrence Divergent Capacities Test for Children and Young People.

The test measures the degree of expression of spontaneous fluency, flexibility and originality of ideas, as well as complexity or rather elaboration of ideas. We did not deal with the last of the above mentioned variables since it partly surpasses the field of divergent thinking.

The Hungarian version of the test, comprises only four subtests out of nine that the original Torrence version contains,

with a minimum of modifications in the form of the stimuli, adapted for younger age levels. The instructions principally remain the same, whereas the scoring criteria are somewhat altered. The test is semistructured of the associative type. The stimulus is perceptually present in all the subjects. However, the responses on the figured subtests are figure-like, paper and pencil type, whereas on the verbal subtests, the responses are written and oral, so that the examiner records them. The children are individually tested in two sessions which are not strictly limited in duration. One session averages about 45 minutes and the interval between two sessions is a month and a half. Each time two problems are assigned, one figured and one verbal and they are assigned to all the testees in the same manner and in the same order.

Subtest "Circles" - A blank, A4 size piece of paper is set before the testee. In the upper left-hand corner, a circle is drawn, the size of a 2 Dinar coin. The child is given colored pencils. The examiner says: "You see this circle? Now you try and draw here (he points along the edge of the paper) as many unusual round objects or things of which the circle makes up the main part. Do that as quickly as you can". The time for this assignment is not limited. In the end, the examiner interprets the meaning of the individual drawings, and writes down their names directly below. The test is of the associative type, fluency, flexibility and originality of responses are scored.

Subtest "Kidney" - picture construction. A blank, A4 size piece of paper is set before the testee. On one side, appart from the paper, there is a piece of yellow, self-adhesive wall-paper, in the shape of a kidney, and the child is supposed to glue it on to the paper. The child is given colored pencils. The examiner says: "You see this yellow paper? (He takes it). First think of an unusual picture, one that no one

else would think of, but remember, the main part of the picture is to be this yellow piece of paper. First imagine the picture in your mind, and once you do, decide where you need to stick the yellow paper, where exactly on this sheet of blank paper. When you stick it on, start drawing the picture you drew in your mind. But remember, you are supposed to think of an unusual picture and the yellow paper is to be its main part". The time for this assignment is not limited. Once completed, the examiner asks the child to give the picture a name, and he writes the title down, word for word. The test is not associative, it resembles free child production and measures only originality because the child gives only one response to the stimulus.

Subtest "Tin Can" - unusual multiple utility. The child is given an open tin can, the color of metal, without any decoration, (lo cm in diameter, 15 cm high). The examiner says:"Take a look at this tin can .,. How could you use it in as many and unusual ways you can? Remember, try to think of how it could be used in as many different and unusual ways." The time for this assignment is not limited. Each response is written down in a separate line so that later, during interpretation, on the basis of the immediate reaction of the child, you can discern individual ideas or the smallest unit that represents a response, and is further treated as a separate item. The test is of the associative type, and fluency, flexibility and originality are scored.

Subtest "Monkey" - object improvement. The child is given to hold a soft, plush toy monkey, 40 by 10 cm in size, brown colored, without any decorations. The examiner says: "Look at this monkey ... You are supposed to think of as many different and interesting ways of making it more attractive. Try and think of as many unusual ways of making it more attractive." The examiner writes down, word by word, everything the child says,

each response in a separate line, so as to be able to discern the basic units of the text to be scored, as in the previous assignment. The test is of the associative type, fluency, flexibility and originality are scored.

Scoring responses. We recorded the results in fluency, flexibility and originality on the associative subtests, (circles, tin-can and monkey), while on the subtest "kidney", which is a free production test, only originality was scored. The measure of fluency was the number of given answers, not counting those answers, which in the individual's flow of associations, repeatedly appear, or contradict the given instructions, (for example: the child draws square, instead of round objects). There were only a few cases in the whole sample, where the answers given were so non-sensical or bizarre that they hat to be left out, otherwise, we did not leave out answers, simply because that which appears to be senseless to us, is not necessarily so to children. Flexibility was scored on the basis of several different criteria, (Torrence's, Kalmar's and ours), all of which basically amount to classifying each answer into a category of responses, in accordance with a given classification, and then counting the number of categories which the testee used while associating. The number of categories of answers used, supposedly showed the individual's inclination toward changing the direction of associations. Originality was also scored on the basis of several criteria, (Torrence's, Kalmar's and ours), all of which were based, in principle, on determining the statistical infrequency of appearance of an answer in the given sample of children. The least frequent answers were scored highest in originality, while the more frequent answers were treated as stereotype, and got no points at all. The sum of points from each given response represented the individual's score in originality on the given subtest.

INVESTIGATION RESULTS

Developing criteria for scoring the HAT-DAT responses.

Besides using Torrence's and Kalmar's criteria in scoring the adapted test, we introduced some additional criteria in order to achieve more precision in measuring certain variables.

Our goal was to establish scoring methods which could best discriminate individuals from the sample. We introduced certain corrections in order to neutralize the inevitable weaknesses of a statistical approach in scoring, so as to accentuate the authentic quality of the responses as best as possible, through quantitative indicators. This is most perceptable when scoring originality of the answers and trying to eliminate answers which are accidentaly uncommon, while basically stereotype. Certain new criteria which exposed some theoretical issues pertaining to divergent thinking, were introduced into the scoring method in order to test their discriminative value in relation to the existing scoring criteria. For example, scoring responses with a time limit and scoring flexibility on the basis of classifications founded on different classification criteria.

1. Fluency, flexibility and originality of responses on the associative subtests was scored in two different ways as far as working time is concerned. First we considered all the answer that the testee gave, after which we considered only those responses given during the first 10 minutes. A comparison of results should help determine whether a 10 minute time limit per problem would significantly affect a change in the results and the order of testees in the sample on the basis of achieved results on the subtests. This dilemma was initially put forth because it is considered that a time limit frustrates the individual and fetters his originality which for this reason tends to appear in later phases of the association

flow. However, we did not find significant variation in the results except in special cases of outstandingly fluent children, which can be determined through a qualitative analysis.

2. Flexibility was scored (besides using Torrence's and Kalmar's criteria), on the basis of a special response classification from the sample, which we set up as a hierarchy. The number of narrower categories in the lower part of the hierarchy, which the individual uses while associating, represents his flexibility score, based on a milder criterion, while the number of wider categories in the upper part of the hierarchy, which the individual uses, represents his flexibility score on the basis of a more strict criterion. Shifting within the scope of narrower and mutually more similar categories is a much smaller step in the change of direction of thought, than is the shifting within the wider and therefore vitally differing categories, so the latter has more value. Classifying the answers into categories as a hierarchy, is based on certain principles which differ from one associative problem to another. Nevertheless, the mutual and fundamental issue was, whether the categories should be formed on the basis of conceptual-logical or image-complex and functionally-complex principles, of which the former are more precise and consistent, and the latter more natural because they come closer to a child's way of thinking and to associative thinking in general. Results show that the practical differences in classification which result from following one of two principles of classification, do not essentially reflect on the results of flexibility. Taking into consideration the subject of our investigation, and the population, we chose the classification principles we thought closer to associative flow and are based upon the image-functional laws of complex thinking. On the other hand, the investigation showed a difference in the flexibility results of individuals, when they were scored on different levels of strictness. Since the mildest flexibility scoring (the

narrowest categories at the bottom of the hierarchy), gives a score very close to fluency, and the strictest scoring (the widest categories from the top of the hierarchy), does not enable good discrimination between individuals in the sample, the categories of a medium level of generality will be considered as the most adequate measure of flexibility. The establishment of a specific classification of responses from the sample, represents quite another problem, because no matter which principles of classification we apply, there will always be a dilemma in classifying certain answers. In other words, the categories are bound to overlap sometimes. For example, a car with round wheels may be classified into category of vehicles, but also as round, rolling objects, together with the wheel and ring, if it happens to appear in such a context. Outstanding sensibility and skill are necessary in the application of a given classification to the individual flow of association, which sometimes implies the joining of two responses into the same category, eventhough, in the general classification, they appear in two separate categories.

3. Originality of responses was scored on the basis of Torrence's and Kalmar's criteria, (each one of them has a table for scoring rare responses), in order to complete the necessary comparison with our scoring criteria, and determine the optimal ones. Our method of scoring was developed on similar principles of statistical rarety of responses, as the foreign authors', but with an additional detail-elaboration and variation of scoring on different levels of strictness. The originality of a response was scored, first through determining the statistical rarety of appearance of a given response in the sample of testees, after which it was scored on a percentage scale in which rare answers carry a maximum number of points. The sum of points acquired for answers on a given problem, represents the originality score of the individual for that given problem. We additionally scored: a) originali-

ty of the first response in each narrow category, while associating, then b) originality of responses leaving out those answers which belong to the high frequency category, and c) originality of response categories, (on the basis of their frequency). Scoring of every first response in each narrow category, was introduced in order to prevent individual consecutive repetition of similar answers within the same category, (even if the orher responses which appeared in repetition are rare in the sample). Scoring originality of responses, leaving out all answers from the high frequency category, was introduced in order to decrease the influence of accidentally rare answers, which are actually common responses, (like those in the high frequency category), on the general originality score. Scoring the originality of categories was introduced as the most rigorous measure of originality. We also find this criterion in Kalmar's scoring, but not separated from scoring of individual answers. However, we find very few rare categories of answers in the associative flow of individuals, so the discrimination of testees based on this criterion is not satisfactory.

PSYCHOMETRICAL FEATURES OF THE HAT-DAT TEST

1. The HAT-DAT Test is relatively subjective, despite the detailed explanation of the response scoring key. As a nonstructured, open type of test, with a goal of searching for rare responses, which are difficult to standardize while scoring, it leaves too much space for subjectivity of the evaluator in the case of repeated testing, where completely new, unscored and unclassified responses will appear. The responses which appear in our particular sample are all classified according to determined, clearly described percentage scales, or evaluated through classifications prior to scoring the individual achievement of the testee. In other words, the same responses

would be identified by the evaluator's using the key and through the availability of a score for each response from the list. There is no doubt as to the presence of certain faults in the process of establishing the scoring norms. For instance, in classifying responses into categories or in setting the standard in advance in determining the percentage for frequency of response, needed to acquire the status of statistical originality. However, the criteria were derived from Guilford's theoretical conceptions, to be applied later by Torrence, and later yet, to be adapted by the Hungarian psychologists Magda Kalmar and associates. Eventhought there may be objections to this theoretical conception, endeavors were made that the criteria be defined and described as clearly as possible.

2. The test is discriminative and relatively difficult. On most of the indicators of all variables on all the test problems of the HAT-DAT Test, the testees are well differentiated in achievement, except that the test sometimes (on certain indicators), shows to be of high standard, which can be noted on the basis of statistical evidence.

3. The test is unreliable in the sense of internal consistency or uniformity and stability in time. The item correlations on both age levels are relatively low, and this also applies to larger groups of test indicators, or rather, to the test problems which may here be considered as parts of the test, and which themselves do not show high mutual correlations. Certain theoretical implications can be derived from the results of the item analysis which are partly confirmed by the preliminary factor analysis carried out on the results of the retest in third grade. The theoretical implications are quite inconsistent with the same variable on different test problems, yet more closely linked to different variables (divergent abilities) on the same test problems. This brings up the prob-

lem of justification of the whole concept of variables as separate divergent capacities, independent of the contents of the test problem. Since the variables within the test problem show high correlation, statistically speaking, they stand for one variable. The problems thus acquire a status similar to compact parallel test forms, which measure one variable. (Not all the test problems are equally compact). However, there is no mutual compaction of problems as parts of a wider test. We may conclude that the test is not homogeneous, or rather, its internal reliability is relatively low. Since the test indicators show a high discrimination value, with a high variance, we may believe the results of the item analysis to be correct.

The retest established that the HAT-DAT Test is unstable in time, that the testees do not retain the same rank in the sample on the same test, or rather, on the same test indicators in first and third grade elementary school. Very few indicators correlate with themselves significantly on the retest, or with other indicators for that matter. The maximum correlation value was 0.45, which means that practically none of the test indicators have prediction ability. In other words, achievement in first grade does not guarantee achievement on the same test indicator in third grade, nor does it gurantee repeated achievement on other indicators. Eventhough there was a general improvement in the results, on most of the divergent thinking variables on the test between first and third grade, the unreliability of the test in time shows that the improvement does not rely on individuals evenly and in accordance with the results of the initial achievement. This means that divergence progresses with the age level with some children, that it stagnates with others, while it even decreases with some children. Reasons for the instability, or rather, that the test is not homogeneous and consistent, probably lie in the specific manner in which divergent abilities are manifested, which we assume, depends, to a great extent, on the present mood, and individual deviations in developmental changes (because of non-linear development).

4. The test is not valid in the sense of criterial and predictive validity and construct validity. Validity of contents was not tested for the very reason that we wanted to test the value of the theoretical conception on which the test lies, through correlating practical activity, as in free child production, for which we have face validity that it gets into the phenomenon of child creativity. Results of the study show that the divergent capacities test does not predict achievement in activities which may be assumed to be significant in the appearance of child creativity, which is our subject of interest here. A possible explanation could be that the test does not measure the same phenomenon. It only measures one aspect of itdivergence, which is one of the conditions of creativity, and divergence cannot in itself be sufficient for prediction of creative achievement. Another possible explanation may be the fact that the conception of creativity, based solely on the concept of divergent abilities and tests which measure it, is unsound, and does not really suite the phenomenon. The last assumption touches the construct validity, which obviously is not convincing enough for the divergent capacities test if it relies on a variable criterion of free child creation. The reliability of the test validity analysis (criterion and construct validity) is at stake here inasmuch that insufficient concurrence between different evaluators of free child production, questions the reliability of the criterion itself. Consequently, this critique does not only pertain to the theoretical concept of divergent abilities, as a condition of creativity, used here, and the test derived from it, but also to the free expert assessment of child creativity.

These analyses show how the divergent capacities test applies to a population of Yugoslav children, on two, elementary school age levels. They virtually show that the HAT-DAT Test does not have good features and that therefore, it would not prove to be of great value in practice, except maybe, only for the pur-

pose of orientation. These analyses answer all the hypotheses which were formed about the psychometrical features of the test objectivity, discrimination, reliability and validity, as well as the evaluation objectivity in repeated application of the test in practice.

THEORETICAL AND METHODOLOGICAL REMARKS

1. Test Prediction and the Status of Divergent Abilities

We can further comment on the theoretical concept of divergent abilities on the basis of these psychometrical features, or rather, divergent thinking and its link with child creativity. We may comment on the status of different divergent abilities ($F_1.., F_x.., Orig.$) and the prediction values of the divergent thinking associative test. Considering the fact that this theoretical concept was based on statistics and tested by it, because it was derived from a test-like model of thinking about human abilities (Guilford's model of human abilities), its statistical refutation represents in fact, its strongest criticism, a critique based on the arguments of the very system undergoing criticism, but by all means, under the assumption that our data is sufficiently representative.

The problematic theoretical status of certain divergent abilities calls for reconsideration of the contents of this concept. The fact that it is not predictive, in the sense of test reliability, suggests that divergent abilities can not be measured through statistical techniques, whereas, in the sense of test validity (non-validity) it indicates we have an inadequate contents or level of generality in the concept of divergence, through which we identify the concept of creativity. The problems which arise in the process of establishing criteria in determining test validity (disagreement between expert evalua-

tions of free child creation) indicates that even the non-test-like approaches to the assessment of child creativity can not be considered to be reliable, and therefore, they are not satisfactory criteria, nor can they serve to test the value of the test as a measuring instrument to be used for the purpose of prediction.

2. The Medium

An increase of higher correlations between different variables, of divergent thinking within the same test problem, and the absence of the same trend between achievements on the same variable on different problems, does not only question the status of certain divergent variables, but also leads to the assumption that the problem, therefore the medium through which the abilities are manifested, play a vital role. For example, there are no fluent testees in general, but rather those who are fluent in certain test problems, in which they are usually, at the same time, both flexible and original. However, results show that this situation is more strongly influenced by the contents of the problem itself and the present motivation of the testee, while solving it, than by the medium in which the problem appears, because there is no connection between results on the same divergent variable, within the same medium, on different test problems. There is no essential link between indicators of fluency for example, on two different verbal problems.

3. The Influence of Fluency on other
   Divergent Capacities in the Test

The achievements in flexibility and even originality, are influenced by the fluency of the testee, because the correlation between these three variables, within the same test problem, are relatively high. Those testees who show more fluency on

the test, make a greater number of attempts, and therefore, have a better chance to accomplish a more flexible and original response. Very few subjects are rigid to such an extent where fluency does not influence other divergent capacities, resulting in a large number of stereotype responses, belonging to the same category. In the case of high fluency, the appearance of original and flexible answers does not have to be the result of a conscious decision on the part of the subject, but may appear by accident. For this reason, while scoring flexibility and originality, we need to somehow eliminate the effects of fluency on these variables, which has already been pointed out by Hocevar D. (1979). There are three possible ways to eliminate the effects of fluency on other divergent capacities: a) keeping fluency a constant, in other words, scoring flexibility and originality on the same number of responses for all testees, b) scoring flexibility and originality only in the initiative phase of the associative flow, when, in the usual noncreative cases, original answers do not appear, so that the appearance of such responses may represent a characteristic of the subject, c) scoring flexibility and originality of responses by determining a percentage ratio between the number of these answers and the total sum of responses, or, in other words, with the score in fluency.

4. The Concept of Transformation (the Combination of Divergent and Convergent) as an Indicator of Creativity

Eventhough fluency is least comprised of convergent factors, and is therefore the purest measure of divergence, it still gives us only information about the condition of quantity of ideas, and not their quality which is significant in creativity, so that we can not give the measure of fluency an absolute priority. This is confirmed in a study by J.L. Danski & I.W. Silverman (1973), in which experimental evidence shows that free play, a creative process, stimulates only original-

ity, whereas fluency may be induced by insisting on imitative (non creative) activities. It may be that this very fact explains a growth in all divergent capacities (including originality) with age, despite our expectation that school may thwart children's originality, because originality on the test, is influenced by fluency, which can be also stimulated by imitative school activities.

Creativity therefore, is a combination of divergence and convergence. If we mean to acquire a predictive instrument for measuring those capacities which are essential to creativity, then we need to establish the instrument on indicators of both convergent and divergent abilities. The concept of complexity, which combines within itself divergent and convergent abilities and is really based upon transformation of the offered stimulus and thus comes closer to the situation of a spontaneous creative act, needs to be more closely investigated as a possible and more adequate measure of those abilities which are the basis of creativity. Even Guilford indicates something similar in his later works (1983), in accordance with his theoretical model.

A B S T R A C T

The objectives of this paper, which represents part of a broad investigation, are the following:

- *testing validity and reliability of the Torrence Divergent Capacities Test (the Beograd version of the Hungarian adaptation),*
- *improving the methodology of scoring the test and determining Beograd standards,*
- *testing the reliability of independent expert assessment of children's paintings and stories, and*
- *deducting methodological and theoretical implications from the results.*

The results of the investigation are:

- *the Torrence Divergent Capacities Test, or rather, free associations test, (Beograd version of the Hungarian adaptation) in young school children (a Guilford type test) is neither reliable (the methods used: item and factor analysis and retesting), nor valid, (the method of correlating test results with results in free child products-painting and story writing, free subject choice). Therefore, the test is not predictive.*
- *independent expert assessment of children's stories and paintings do not concur. Free assessment of products has not proved to be a better indicator of divergent abilities than the test.*
- *if we begin by considering the basic ideas of Guilford's theory, the test method of evaluation may be improved by introducing minor modifications, which however, are not sufficient in acquiring a higher quality of results.*

- *the status of divergent abilities (fluency, flexibility and originality) and their definitions are problematic because different variables within the same test problem, are more closely associated than are indicators of the same variable on different test problems.*
- *there are certain indications that the contents of a specific test problem and the present motivation of the testee solving it, influence his divergent achievement on all variables, more than the medium, or rather, the type of test problem (figure-like or verbal).*
- *fluency on the test itself, affects the results in flexibility and originality, and these effects need to be eliminated in future investigations.*
- *a qualitative analysis of students' responses indicates that the concept of transformation (complexity of responses), which combines both divergent and convergent thinking and thus comes closer to the situation of a spontaneous creative act, should be considered as a possible and more adequate measure of those abilities which are the basis of creativity.*

CONCLUSION:

Guilford's theoretical approach and methodology of investigation of child creativity, or divergent abilities, should be revised.